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An Inaugural Essay

On
Miasmata

Submitted for the Degree of

Doctor of Medicine by

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On Miasmata

There he, only made a nosegay of culled flowers & heard brought, nothing but the thread that ties them. An on.

My object in the present essay is, not to enter into a minute investigation of the subject of miasmata, but merely to state the general opinion, with regard to them & the facts & reasonings upon which they are founded. To attempt, more, would indeed appear to me an idle & presumptuous undertaking. From experience, I can know nothing. To indulge in unmeaning speculation, is foreign to my habits. Miasmata have been variously divided & arranged. I shall confine my attention to that species of miasm, which has been by the Italians called Malaria or bad air. To Linnæus has been awarded the merit of having first called the attention of the medical world

to this subject - To his writings in deed we are indebted for a great portion of the information we possess concerning their nature & origin - Miasmata in the sense I have indicated I shall define to be effluvia, exhalations from vegetable in a state of decay or putrefaction Much I know has been said & written with respect to the power of putrid animal substances of eliminating pestilential effluvia: these opinions have however been so fully and ably refuted by Prof. Chapman in his "Thoughts on Epidemics" that it would be merely retracing his steps to attempt any thing further - Concerning the precise nature of miasmata, little or nothing is known - Various opinions have been offered on the subject; some of them plausible indeed; none of them clear or satisfactory - Here the resources of Chemistry, so inestimable on many occasions, have furnished us with no data, on which

to find a rational explanation of the
phenomena which they excite in the living
system. According to Berthollet the air disenga-
ged from marshy situations, is hydrogen hold-
ing carbon in solution, containing something
besides of the nature of an animal oil.^a
Vano as quoted by Lancisi supposed the no-
xious qualities to depend on the existence of ani-
malculy, in the exhalations. Christian Langius
(he observes), is a strenuous supporter of this opinion
for he imagined that poisonous spirits or verminous
atoms were exhaled from putrefying bodies &
then inhaled by the breath or absorbed through
the pores & scattered their venom through the
bowels. The animalcular nature of malaria
I have heard ingeniously & ably advocated by
our distinguished Prof of Surgery. in his lec-
ture, so far at least as regards Yellow fever.
It has also been supposed that those soils which

^a Journal de Physique, tom. XI & Miscellany translations of Lancisi in N York
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have been termed miasmatic, produce disease
by depriving the air of a portion of its oxygen;
but this is satisfactorily shown not to be the case
from the fact of the Eudiometer shewing no
difference whatever in the quantity of oxygen be-
tween them & the most salubrious situations—
Moreover Gallani states, that in repeated ex-
periments, he found "the air of the putrid man-
sions of Fort Fuentes, two degrees purer than the
air at the summit of mount Legnone, which
is always covered with snow & is elevated
above the sea 8640 ft^o. Yet although we
know so little of their nature, the circum-
stances under which they are generated have
been pretty clearly ascertained. To their for-
mation Heat & Moisture are essentially ne-
cessary, & the circumstances under which
they are produced may be classed un-
der four heads—

1st Stagnant pools or marshes. 2nd The sites of these pools or marshes, the water having been dissipated by the action of the sun & a dry crust being left on the surface. 3rd Newly cleared or ploughed grounds. 4th A soil composed principally of clay. In any of the above named situations a certain degree of heat is capable of producing that temperature of the atmosphere, to which the application miasmatic, has been applied. The degree of heat is not however definitively settled. Some contending, amongst whom, is Dr. Rush that a very high temperature, even that of 80 is necessary. That this is true, with regard to Yellow fever, there does not seem much room to doubt; but experience has shewn, that the milder forms of fever may be excited at much lower temperatures. This is the opinion of Prof. Chapman.

the truth of which, he establishes, by the simple fact of putrefaction taking place at much lower temperatures, than 80° . The violence and malignancy of the fever appears to depend very much if not entirely upon the degree of heat, as is exemplified in the fevers of tropical climates, proving more fatal than those of cold or temperate situations. Yet though heat be essential to the formation of noxious exhalations, when excessive & combined with moisture, the putrefactive process is prevented from going on. This fact is observed in the interior of Africa, where camels having died in their journey through the deserts never putrefy, the moisture being so rapidly carried off by the heated atmosphere. The same thing is said by travellers to occur in the hotter & more sandy parts of South America. Heat

therefore it appears is of itself insufficient to
produce those dreadful effects which have
been attributed to it, unless when acting thro
ugh the medium of a moist atmosphere.
But it has been justly remarked by Pringle^a
that "we must distinguish between moist &
rainy seasons; for in marshy grounds, to be sure
& continued heat, even without rain occa-
sion the greatest moisture, by the exhalations
which they raise & support in the atmosphere.
whereas frequent showers during the hot sea-
son, cool the air, check the rise of the
vapours, dilute & refresh the corrupted waters."
Lind states, that in Guinea, which has
but properly but two seasons, the wet &
the dry; the rainy is the season of sickness:
whereas for many months in the dry season
most parts of the country are equally
healthy & pleasant with any in the world,

and even the woods and morasses are tolerably healthy - Again he adds. I am informed by a surgeon who practised some time in Senegal, that for several months during the dry season, the country was as healthy and as pleasant as any in the world; but soon after the rainy season began, a low malignant fever appeared which constantly spread itself amongst the Europeans. Directly the reverse of this, according to Heurteloup happens at New Orleans. In rainy season in New Orleans he says is always a healthy one, by keeping the ponds filled with water; whilst it has a contrary effect upon the country generally. This he attributes, to the circumstance of the ~~decomposition~~ decomposition of the subjacent matter being prevented by the body of water which keeps it at a temperature below that necessary for a speedy decomposition. But in the latter instance

as soon as the water shall have in some degree dried up the Evolution of the miasma commences".^a It has been already remarked that "the stity of pools or marshes, the water having been dissipated by the action of the sun & dry crust being left on the surface" are capable of eliminating noxious effluvia. This might at first sight appear to be in contradiction to the general proposition that moisture was essentially necessary to their formation: but a short examination will suffice to show that it is in perfect accordance with what has been advanced. The soil though dry on the surface is moist beneath & upon examination this crust will not be found to extend further than a few inches below the surface, where the soil will be found to consist principally of decaying vegetable materials, the exhalations from which find a ready outlet, through innumerable

^a Seeley, on Sanitariness of Ponds & Sluys, p. 22.

cracks in the crust above, and as might reasonably be expected in a highly concentrated form. The escape of these gases is much facilitated by the very circumstances, that prevent their escape in those situations where water already exists. I allude to frequent showers; which by softening the ground permit their escape in larger quantities. Pringle, speaking of the diseases of "Holland, says, "rain falling in a dry season when the ground has been parched up by intense heat, so far from refreshing & purifying the air, loads it with the most pestiferous miasmata". From what has been said it will easily be understood, how newly cleared or ploughed grounds, produce fevers. In the first case where lands have been newly cleared, vegetable matter, as plants, leaves, roots, &c. in a state of decay which had previously been protected by trees from the influence of the

The first object of the present work is to
 present a complete and accurate
 description of the various
 species of the genus, and to
 show the relations of the
 different species to each other
 and to the genus. The work
 is divided into two parts, the
 first of which contains a
 description of the species, and
 the second of which contains
 a description of the genus.
 The first part is divided into
 two sections, the first of which
 contains a description of the
 species, and the second of which
 contains a description of the
 genus. The second part is
 divided into two sections, the
 first of which contains a
 description of the species, and
 the second of which contains
 a description of the genus.

Sun, being exposed to the immediate action
 of its rays, putrefaction & consequently the
 elimination of an wholesome & salutary state
 place. In the second instance, the decomposition,
 which has been going on subterraneously,
 is prevented from displaying its effects, but as
 soon as an outlet is afforded by ploughing
 or digging, to the effluvia generated & the ex-
 posed earth being subsequently left to be acted
 on by the solar influence the same consequences
 result as already described. I have mentioned
 another situation favorable to the produc-
 tion of this poison, viz. a soil composed prin-
 cipally of clay. This fact was first pointed
 out by Linnaeus, who goes so far as to af-
 firm that it originated in all places where clay
 abounded & only in such places. He suppo-
 sed that the particles of clay being dissolved
 in the water drank by the inhabitants of

that which seems to me the most satisfactory is
 the one assigned by Johnson. That the vapours which
 are exhaled during the day & diffused through the
 atmosphere are met by the descending cool dews,
 by which they are condensed & descend with them.
 De Lisle says that the dew is so much dreaded
 at Rome, that at the close of the day, the inhab-
 itants retire to their houses; but after the first
 precipitation of vapour takes place, the streets
 are more crowded than before of the bad &
 even fatal effects of night air in so many
 situations numerous examples are related by
 Linnæus from whom I extract the following.
 In a voyage to the coast of Guinea performed
 in the year 1766 by the Phoenix ship of war of
 40 guns; the officers & ships company were
 perfectly healthy; till on their return home
 they touched at the Island of St Thomas. Here the
 captain unfortunately went on shore to spend

a few days in a house belonging to the Portuguese governor of the Island. This happened during the rainy or sickly season. In the same house were lodged the Captain's brother, the surgeon, some midshipmen & the Captain's servants. But in a few days after their being on shore, the Captain's brother, surgeon & every one to the number of seven, who had slept in that house were taken ill and all of them died, except one, who returned to England, in a very bad state of health. The ship lay at anchor there, twenty seven days, during which time, three midshipmen, five men and a boy, remained on shore, for twelve nights, to guard the water castles, under the pretence, that the Islanders would steal them: all of whom were likewise taken ill, & only two escaped with life. At that time, only three who slept on shore, were taken ill; no other man of the ship's company was seized with any distemper, during the ship's stay there.

To this, thousands of other examples might be added from various writers; but this I presume will be sufficient, to place in a strong point of view, the dangers of ~~er~~right air in unhealthy climates. The extrication & diffusion of marsh effluvia, are also very much influenced by the prevalence of particular winds - Lind says, that the years 1706 & 1707 were distinguished by the uncommon appearance of intermitting & remitting fevers, in most parts of England. One obvious cause of them was, the unusual frequency of unwholesome easterly winds. - He further adds "an East wind in England, is often accompanied with a fog, which it is said to bring with it from the sea: but the truth of the matter is, that this wind raises a copious vapour from water, mud & all marshy or damp places. - Morely observes, that an East wind is felt in England by invalids, in their very beds - With

respect to the deleterious influences of the East winds, all writers agree - Forster says that in every country in the world the east wind is almost proverbially unhealthy - Casual changes to East produce headaches, & nervous complaints, & a long continued wind from that quarter produces an unwholesome season^a The men according to Lind, in those ships which lie in the river of Canton, are subject to agues, occasioned by the North West winds in November, which blow in that season over the extensive rice grounds. But though the winds exercise such an influence in the elimination & subsequent depuration of these Effluvia, hurricanes, are said to arrest for a time the course of a pestilential disease in Tropical climates. This fact was noticed by Carstensen who says; "I have several times, noted epidemic fevers, greatly abate both as to number & violence after storms & heavy rains."

^a Forster on the Steam plow p 152 & Caldwell on Yellow fever p 31

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As to the distance to which the miasm poison may be carried authors are not agreed. It is not improbable that much may depend on the particular state of the atmosphere at the time. In the work to which I have just alluded (Forster on the Atmosphere) the following question is proposed - "Is it possible, that there may be some quality in the air at particular times, whereby it is fitter for the conveyance of infection, than at others?" That there is, I have no doubt, but what that particular state of the atmosphere consists in I am not prepared to say, yet I cannot help suspecting that it is, in some way connected with moisture. What renders this idea probable, is, that intermittent, & remittent, prevail most extensively in Spring & Autumn, the seasons, most remarkable for rains. Yet it cannot be denied that we have fevers & those prevailing epidemically too, in the

driest seasons: hence I think we ^{may} well admit
 that we know almost as little of it, as of that
 constitution of the air which is best fitted for
 the propagation of small pox, measles, or
 influenza - Unless carried by the wind there
 is every reason to believe that the influence of
 marsh miasmata is very limited - Much
 however must depend on the extent of surface
 from which they are exhaled - During calm
 weather they extend but a few yards proba-
 bly from their source - They have proved harm-
 less at the distance of two cables' length where
 water intervened - Bancroft mentions a
 quarter or half a mile as the greatest dis-
 tance to which they seem capable of being
 carried even under the most favorable cir-
 cumstances - This notion is certainly unfoun-
 ded - That they did not extend further in
 the instances he has quoted, is doubtless true,

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but here water intervened & we are well aware
of the power of this fluid of absorbing these
effluvia. Where they are not obliged to pass
over water their sphere of action is much more
extended. The Pontine marshes are several
miles from Rome & yet when the wind blows
from that quarter it frequently fills the town
with pestiferous miasmata.

The Height to which marsh effluvia ascend
has also been disputed. De Lisle says that
Monte Mario which is adjoining to Rome
& the one, in all the insalubrity of the neigh-
bouring country is according to Bayle 143 yards
above the level of the sea. Tivoli
which according to the same writer has an
elevation of 268 yards is infinitely more healthy.
According to accurate measurement com-
municated by M De Prong, Lizza whose
inhabitants seem to be out of the reach

of the bad air is 300 yards above the Pontine
marshes. The village of St Felice on the mountain
of Circe on the other side of the marshes which
is only 114 yards high & still lower down the
environs of Genachina, which is 38 yards high
are more & more exposed to the malignant influence
of the miasmata that arise from them. It would
seem therefore that the limit to which they extend
is somewhere between 208 & 306 yds above the
level of the places where the miasms arise: but
this cannot be absolutely fixed as it varies from
year to year according to the heat, the wind
that blows & the intensity & duration of both.^a
This statement does not coincide with that of other
writers of authority who confine them within
much narrower bounds. This seeming contra-
diction of sentiment may however I think be in
some degree reconciled by observing that the
calculations of Lind are derived from facts

^aLind on hot climates p 114

occurring in situations peculiarly adapted not only to the escape but to the dissemination of these unwholesome vapours. Much we know depends on the quantity & extent of the putrefying materials, & in positions more circumscribed than the Pontine marshes, the effects would be proportionately diminished: hence we can readily conceive the truth of the statements made by army & navy surgeons of soldiers stationed in the third stories of houses remaining almost perfectly healthy, whilst those on the basement stories, were seriously attacked. All agree that the more lofty the buildings are the better; for the tenants of the upper stories, not only enjoy better health, but when taken ill have the disease in the mildest form^a. In reviewing the history of miasmata one feature presents itself as remarkable - it is the ease with which they are accepted - Their

escape is said to be prevented entirely, by a thick
 scum forming on the surface of ponds or marshes.
 Even under circumstances the most favorable
 to their formation - Numerous instances of
 disease might be quoted from imprudently
 clearing off this covering - Persons, it is said, in
 the most exposed situations have entirely es-
 caped their deleterious effects, from sleeping
 merely under the cover of canvas - The pres-
 ervative power of trees against the invasion of
 this enemy are well known - McCaspar ob-
 serves, that the marshes in the Antilles are
 less injurious to health in proportion as they
 are more completely shaded by trees from the
 action of the sun - The neighbours in gen-
 eral, sustain from them no other incon-
 venience than that which results from the
 vicinity of a very moist atmosphere;
 but when the trees are cut down & the earth

expedient, related to the immediate action of the solar rays, malignant fevers begin to rage amongst the surrounding inhabitants, & destroy the greater part of those who had been employed in clearing the land - Dr Chapman relates, that many situations in the United States, formerly sickly, have been rendered healthy, by planting rows of trees between them & the miasmatic spots - These facts, shew that by proper precautions, much may be effected in marshy districts, towards obtaining protection from the baneful influence of their exhalations - Besides, the rule of interposing a barrier of trees when practicable, cultivation of these malarious situations, is proposed by Ferguson as a counter agent to their injurious effects, by "exhausting the morbidity ^{perhaps} by a constant succession of crops -"

Other precautions, altogether personal are also recommended by authors. The principal of these are - Never to ~~venture~~ to enter the infected districts, before sunrise or after sunset - Never to enter them, with an empty stomach, on this account a small quantity of food should be previously taken - Some have recommended that small quantities of wine, liquors or ardent spirits should be substituted. In the propriety of this practice I cannot concur. It is not stimulation of the stomach that is required, but something to induce the exercise of its peculiar functions, whereby it is better able to resist the aggression of morbid agents. Besides, the stimulation of these liquors is evanescent & after this has subsided the system is left more obnoxious to the cause of disease. Attention should also be paid to diet

the first thing I noticed when I stepped
out of the car was the smell of the
fresh air. It was a relief after the
stuffy atmosphere of the train. I
looked around and saw a few people
walking towards the station. The
ground was covered in a layer of
snow, and the trees were bare.
I felt a little nervous, but I
tried to relax. I took a deep
breath and walked towards the
entrance of the station. The
doors were open, and I saw
a few people waiting. I
walked towards them and
saw a man in a uniform.
He was looking at me and
I felt a little uncomfortable.
I walked past him and
saw a woman sitting on a
bench. She was looking at
me and I felt a little
nervous. I walked towards
her and she smiled at me.
I felt a little better and
I walked towards the
entrance of the station.
The doors were open and
I saw a few people waiting.
I walked towards them and
saw a man in a uniform.
He was looking at me and
I felt a little uncomfortable.
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I felt a little better and
I walked towards the
entrance of the station.

and clothing. As a general rule it may be remarked that whatever has a tendency to weaken or derange the healthy actions of the animal economy, renders the system a more easy prey to morbid agents. Hence there is no practice which we are called upon more loudly to condemn, than that of some misguided individuals, who led away by their own passions, have persuaded themselves, & would fain persuade others, that the best means of prevention, consist in the constant use of ardent spirits, & that carried even to intoxication. In this country particularly, where ardent spirits are so plenty & so cheap, such a notion cannot fail of entailing the most fatal consequences & we are called upon by every feeling of humanity to discommence the practice. As preventives, it has also been recommended that the dwellings should be

so constructed, that there should be no windows
 or doors fronting the marshes & that the smoke
 from the fires should be permitted to diffuse
 itself through the house. Sir Gilbert Blane
 says that certain internal medicines, such as
 bitters, aromatic, & small quantity of vinous
 liquors, tend to preserve the body from its bad
 effects. Sir Gilbert also remarks that as fevers
 produced by marsh effluvia do not shew
 themselves for some days, it would be advi-
 sable to take some doses of Peruvian bark
 after clearing the bowels by a purgative.
 An emetic I should suppose would be the
 more appropriate remedy. The spices of the
 country (E. Indes) he also remarks have also been
 found powerful in fortifying the body, agai-
 nst the influence of noxious air. This, one
 among many circumstances, that go to prove
 the truth of the general proposition, that

whenever Providence inflicts an evil it is always
accompanied by the remedy or the preven-
tive—

Repeat March 7 1821

